

Systematic Review

The Diagnostic Approach to Headache in Otorhinolaryngology: A Systematic Review

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ABSTRACT

Headache is a broad term that encompasses various types of head and neck pain syndromes. It is a ubiquitous symptom that frequently prompts patient presentation to otorhinolaryngology (ENT) clinics. While most headaches are primary headache disorders, a significant proportion can be secondary to underlying pathologies within the head and neck, falling within the purview of ENT specialists. The challenge lies in differentiating benign primary headaches from potentially serious secondary causes. This systematic review aims to synthesize the current literature on the diagnostic approach to headaches in otorhinolaryngology, focusing on the essential elements of history taking, physical examination, specific ENT-related differential diagnoses, appropriate investigations, and the crucial role of red flag identification.

Keywords: Headache; Sinus headache; Sinusitis; Contact point; Otorhinolaryngologist; Secondary headaches; History and physical

INTRODUCTION

Headaches are a common debilitating medical condition experienced by people of all ages. According to an estimate, it affects millions of patients annually.¹ The lifetime prevalence of headache is 90% in males and 95% in females.² Only a small percentage of those affected, get properly diagnosed.³ Untreated headaches can disrupt the patient's lifestyle by causing sleep disturbance and missed work. ENT specialists can play a vital role in identifying, evaluating and managing headaches.

International Headache Society has laid guidelines for headache classification according to the International Classification of Headache Disorders (ICHD).⁴ It categorizes headaches as primary and secondary. The primary headache has no identifiable pathologic condition; classic examples are migraine or cluster headache, tension-type headache), while the secondary has a definable pathologic process (e.g. traumatic, infectious, neoplastic, etc).⁵ Generally, a thorough history, physical and neurologic

examination are sufficient to differentiate between primary and secondary headaches.

In the field of Otorhinolaryngology (ENT), secondary headaches can be associated with various disorders and conditions in the head and neck region. It may vary from mild pain to life-threatening conditions. However, essential to note that not all headaches are related to ENT issues, and primary care physicians or neurologists often play a significant role in diagnosing and managing headaches. This systematic review aims to provide a structured overview of the diagnostic process for headaches encountered in ENT practice, drawing upon existing evidence to guide clinicians in identifying the most relevant investigations and management pathways.

MATERIALS AND METHODS

Search Strategy: A systematic literature search was conducted across major electronic databases including PubMed, Embase, and Google Scholar from their inception up to May 2025. The search utilized a combination of MeSH

and keywords, including but not limited to: "headache," "facial pain," "otorhinolaryngology," "ENT," "diagnosis," "diagnostic approach," "diagnostic algorithm," "sinusitis," "rhinosinusitis," "cranial neuralgia," "temporal arteritis," "red flags," "nasal endoscopy," "imaging," "CT scan," "MRI," "sinus headache," and "migraine." Filters for English language publications and human studies were applied.

Inclusion and exclusion criteria: Studies were included if they were research articles (observational studies, clinical trials, systematic reviews, meta-analyses); focused on the diagnostic approach to headache in the context of otorhinolaryngology practice and provided information on diagnostic criteria, clinical findings, investigational utility, or specific ENT-related causes of headache.

Studies were excluded if they focused exclusively on primary headache disorders without significant ENT overlap or were purely review articles without original data (unless they were systematic reviews or meta-analyses relevant to the diagnostic process). Animal studies or in vitro research were also excluded.

Data Extraction and Synthesis: Data concerning common presentations of specific ENT-related headaches, etiologies, diagnostic tools employed (history, physical exam, endoscopy, imaging, lab tests), diagnostic accuracy, and identified "red flags." were extracted from studies. Due to the heterogeneity of study designs and diagnostic pathways, a narrative synthesis was primarily performed, highlighting key themes and presenting a practical diagnostic algorithm.

RESULTS

The literature search identified numerous articles addressing headaches and facial pain. After careful screening, a final number of 20 relevant studies were selected for detailed review. These studies primarily consisted of retrospective case series, cross-sectional studies, and expert consensus papers. Randomized controlled trials on diagnostic algorithms for headaches in ENT are understandably scarce due to the nature of diagnostic studies. Let us start the diagnostic approach with the fundamental knowledge of common causes of ENT-related headaches.

Common ENT-related headaches, their etiologies and diagnostic clues

a. Sinus headaches: Sinusitis due to inflammation or infection of the paranasal sinuses, is a frequent cause of sinus headaches. Patients often present with facial pain, pressure, over the frontal, maxilla or eyes, temporal/mandibular pain, facial spasms or otalgia.⁴ The edema/swelling of the mucosa, blocks the sinus ostia, resulting in fluid collection and secondary bacterial

infection. Both acute and chronic rhinosinusitis are the most prevalent cause of headaches in ENT outpatient practice.⁶ The pain often worsens with changes in weather, with flight or diving and improves with topical nasal decongestant.⁷ Otorhinolaryngologists play a crucial role in diagnosing sinusitis through physical examination and imaging, followed by managing sinus issues through medical and surgical interventions when necessary.

b. Contact point headaches: Various anatomical variations may lead to mucosal contact inside the nose. It may be due to septal deviation, nasal spurs or concha bullosa. It may also result from hypertrophy of the inferior turbinate, medialization of the middle turbinate or uncinate process, or paradoxical middle turbinate or large ethmoidal bulla.⁸ These patients are characterized by the absence of nasal symptoms and no evidence of sinusitis in radiology.

c. Migraines and Allergies: Allergic rhinitis, a common ENT condition, can exacerbate migraine headaches in some individuals. The headache is recurrent, unilateral, pulsating and aggravated by activity. It may last from 2 to 72 hours. Often, nausea or vomiting and sensitivity to light, sound or smell are present. Otorhinolaryngologists can evaluate and treat allergic rhinitis, providing relief to patients with concomitant migraine headaches.

d. Ear-Related Headaches: Conditions such as ear infections, eustachian tube dysfunction, or problems with the inner ear can lead to headaches. Ear infections like malignant otitis externa, and Ramsay Hunt Syndrome are often present with headache. Chronic Otitis media with intra-cranial complications like extradural abscess, meningitis, brain abscess and intra-temporal complications like mastoiditis patient has a headache. Otorhinolaryngologists are equipped to diagnose and treat ear-related issues, potentially alleviating associated headaches.

e. Temporomandibular Joint (TMJ) Disorders: TMJ disorders can result in jaw pain and headaches. Otorhinolaryngologists may work in collaboration with oral and maxillofacial surgeons to assess and manage TMJ disorders, offering both conservative and surgical treatment options.

f. Sleep-Related Headaches: Sleep apnea is a disorder where disrupted breathing during sleep may result in morning headaches. Otorhinolaryngologists can evaluate the upper airway to diagnose sleep apnea and provide appropriate treatments, including surgical interventions like uvulopalatopharyngoplasty (UPPP) or continuous positive airway pressure (CPAP) therapy.

g. Throat and Tonsil Issues: Infections or chronic conditions affecting the throat and tonsils can lead to headaches. An elongated styloid process may irritate the glossopharyngeal

nerve and pain often radiate to the head. Otorhinolaryngologists are well-trained to diagnose and treat throat-related issues, potentially resolving associated headaches.

h. Head and Neck Tumors: Pain in cancer patients is chronic and is often due to infiltration of growth in the surrounding tissue. Growth of the ear and nose may involve skull base, may have perineural spread and cause persistent headaches. ENT specialists are trained to evaluate and diagnose such tumors, collaborating with other specialists for further management.

i. Trigeminal neuralgia (TN): Also referred as tic douloureux, it is a complex pain syndrome. Often many a diagnosis of TN is made in ENT out-patient department. It is more prevalent in women between their fifth to seventh decade of life. Patients present with sudden, severe, piercing, unilateral facial pain for brief periods, often elicited by triggers like brushing or face wash and duration is typically only seconds with spontaneous remission.⁹ The pain involves the second and third divisions of the trigeminal nerve.¹⁰ The physical examination is normal between the attacks with no sensory deficits.

"Red Flags" in Headache Assessment (When to Suspect Serious Pathology)

ENT specialists must be vigilant for "red flag" signs that warrant urgent neurological referral or further investigation as shown in Table-1.

Table-1: Red Flags in Headache Assessment

Presentation	What to suspect
"Worst headache of life" (thunderclap headache)	Suggests subarachnoid hemorrhage
New headache in patients over 50 years old	Increased risk of giant cell arteritis, malignancy
Sudden onset of headache especially if reaching maximum intensity within seconds to minutes	Migraines, high blood pressure, infections, stroke or brain bleed
Headache with fever, stiff neck, altered mental status, or seizures	Meningitis, encephalitis
Headache with focal neurological deficits (e.g., weakness, numbness, visual field defects, papilledema)	Intracranial lesion, stroke
Headache worsened by Valsalva maneuvers (coughing, straining)	Suggests increased intracranial pressure
Headache in an immunocompromised patient or patient with a history of malignancy	Increased risk of opportunistic infections, metastases
Progressive or worsening headache	Brain tumors, infections

Headache associated with eye pain, redness, or visual changes (e.g., diplopia, vision loss)	Glaucoma, orbital pseudotumor, giant cell arteritis
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Clinical assessment

Otorhinolaryngologists employ a variety of diagnostic methods, however, the foundation of diagnosis lies in a detailed history and thorough physical examination.

History Taking

A Detailed History of symptoms like onset, headache site, character, severity, radiation, facial pain, nose discharge, nose block, loss of smell, and dental caries should be asked for. Any triggering factor like touch, change in position, straining or bending forward also gives useful clues. Additional associated complaints of any head trauma, neck or facial pain, vision loss, light or sound sensitivity, hearing loss, ringing or spinning sensation, aural fullness or discharge, nose block or discharge, loss of smell, dental pain and nausea/ vomiting should be asked for. In addition, a history of allergies, recurrent sinusitis, trauma, and systemic diseases (e.g., autoimmune conditions, malignancy, immunosuppression) should be actively sought. Moreover, medication history, particularly, overuse of analgesics can lead to medication overuse headache. The various components of a good ENT history are listed below.

Character of Pain: Location (e.g., frontal, periorbital, unilateral), quality (e.g., throbbing, pressure, sharp, burning), severity, onset (sudden vs. gradual), frequency, and periodicity.

The duration of headache episodes (less or more than 4 hours) and the frequency (less or more than 15 days in a month) help in differentiating the cause.¹¹ Headaches lasting less than 4 hours include cluster headache, paroxysmal hemicrania, primary stabbing headache (ice-pick headache), primary cough headache or exertional headache. Headaches lasting more than 4 hours (often much longer, even days) are migraine, tension-type headache or hemicrania continua. Acute sinusitis headaches typically last less than 4 weeks, however Subacute sinusitis may have symptoms lasting between 4 and 12 weeks and chronic sinusitis persist for a minimum of 12 weeks.

Frequency of headache episodes (per month): Episodic headaches (less than 15 days per month), most migraines and tension-type headaches fall into this category. In chronic or recurrent cases of sinusitis, headaches can be persistent or occur frequently during flare-ups. Chronic headaches are those occurring 15 or more days per month for at least 3 months. These include chronic migraine, chronic tension-type headaches, and medication overuse headaches.

Associated symptoms are common and important guide in diagnosing ENT-related headaches. These are listed in table. It is important to note that many patients with migraine report sinus symptoms, leading to a misdiagnosis of "sinus headache." A key differentiator is the character of nasal discharge (clear in migraine-associated rhinitis vs. purulent in bacterial sinusitis) and the presence of fever (Table-2).

Table-2: Associated Symptoms of Headache

Associated Symptoms	What to evaluate?
Nasal/Sinus Symptoms	Nasal congestion, rhinorrhoea (character: clear vs. purulent), post-nasal drip, anosmia/hyposmia, facial pressure/tenderness, fever (suggesting acute infection)
Ear Symptoms	Otalgia, aural fullness, hearing loss, tinnitus, vertigo (e.g., in otitis media, mastoiditis, temporomandibular joint (TMJ) disorders)
Throat/Oral Symptoms	Sore throat, dysphagia, odynophagia (e.g., tonsillitis, pharyngitis, laryngeal pathology)
Ocular Symptoms	Eye redness, lacrimation, visual disturbances (e.g., in cluster headache, orbital pseudotumor, glaucoma)
Neurological Symptoms	Numbness, weakness, visual changes, diplopia, imbalance (raising concern for intracranial pathology or cranial neuropathies)
Systemic Symptoms	Fever, weight loss, malaise (suggesting systemic inflammatory conditions or malignancy)
Aggravating/Relieving Factors	Positional changes, Valsalva maneuvers, exposure to allergens, medication use

Physical Examination

A comprehensive examination of the ear, nose, throat, head and neck region should be carried out to identify sources of pain, such as sinus tenderness or enlarged tonsils. The various components of the examination are tabulated below (Table-3).

Diagnostic nasal endoscopy

This plays a significant role in evaluating ENT-related headaches, particularly those originating from the sinonasal region (rhino-sinogenic headaches). Direct visualization helps identify anatomical variations or pathologies that can contribute to headaches, such as deviated nasal septum and

septal spurs causing "contact point headache", nasal polyps, turbinate hypertrophy sinusitis, tumors or other masses and foreign bodies. Diagnostic nasal endoscopy can also assess sinus health and drainage and guide further investigations and treatment.

Table-3: Physical Examination in Headache

General Head and Neck Exam	Palpation of the sinuses, temporal arteries, TMJ, cervical lymph nodes
Nasal Examination	Anterior rhinoscopy, nasal endoscopy: Assessment for mucosal edema, discharge, polyps, septal deviation, masses, or contact points
Oral Cavity and Oropharynx Exam	Dental assessment, pharyngeal inflammation, tonsillar hypertrophy
Otoscopic Examination	Tympanic membrane integrity, middle ear effusion, signs of infection
Cranial Nerve Examination	Particularly trigeminal nerve sensation, facial nerve function, and other cranial nerves if neurological symptoms are present
Cervical Spine Examination	Range of motion, tenderness (for cervicogenic headache)

Diagnosis

Radiological studies

Imaging, such as X-ray paranasal sinuses, computed tomography (CT) scans or magnetic resonance imaging (MRI), to visualize the sinuses, ears, or other structures in the head and neck.

CT paranasal sinuses may reveal inflamed and swollen sinus lining, mucosal thickening/ fluid retention, purulence/ sinus outflow obstructions and polyps. In cases of severe or persistent sinusitis, especially if there are signs of complications (e.g., orbital cellulitis, intracranial extension), a CT scan can help identify these serious issues. Besides, it can identify contact points due to anatomical variations like concha bullosa, and septal spurs.¹² For conditions affecting the temporal bone (e.g., mastoiditis, tumors), a CT can provide a detailed image of bone structures. CT can help identify lesions at the skull base that might be causing pain or neurological symptoms.

The MRI can assist in identifying the cause of trigeminal neuralgia, be it demyelination or compression due to neoplasms, aneurysms or aberrant vessels. MRI with gadolinium helps rule out cerebellopontine angle pathology and vascular loops around the Gasserian ganglion.

Lab investigations

Blood tests like hemogram, coagulation studies, erythrocyte sedimentation rate, and C-reactive protein help in diagnosing infections, hemorrhagic, vasculitis and other inflammatory conditions. Also, blood tests to identify allergens contributing to headaches and lumbar puncture for cerebrospinal fluid analysis may be done, if required.

Management

Management of ENT-related headaches involves treatment focusing on addressing the underlying ENT condition.

The Medical treatment includes antibiotics, antihistamines, decongestants, intranasal corticosteroid spray, and anti-inflammatory drugs, to manage underlying ENT conditions. They help in reducing sinonasal mucosa edema and facilitate drainage of the sinuses. Oral corticosteroids and immunotherapy are helpful in severe allergic rhinitis cases. Medications for migraine are beta-blockers, tricyclic antidepressants (prophylactic), triptan or ergotamines (abortive) or pain medicine like aspirin (rescue). Carbamazepine is the first-line drug for treating TN.¹³

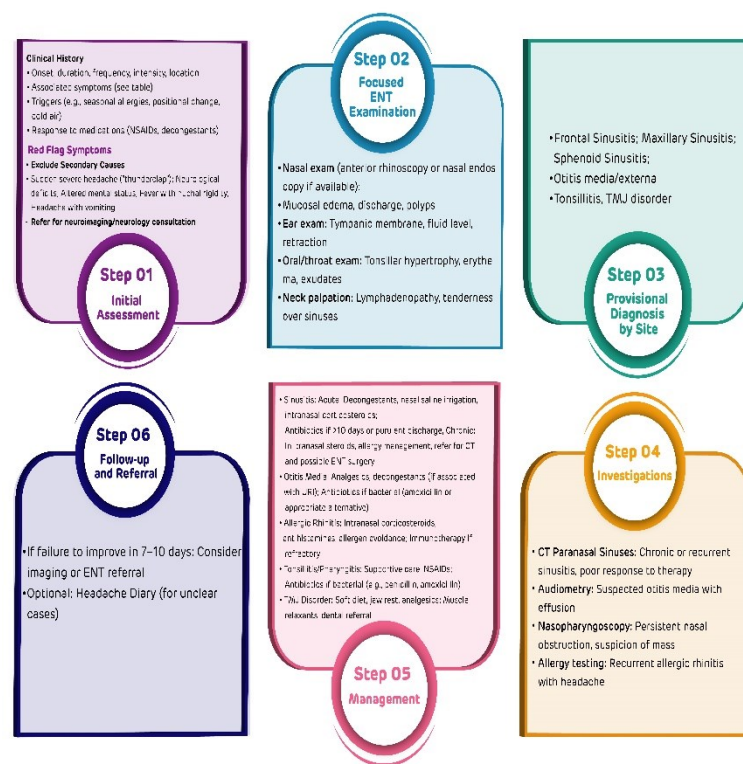
The WHO advises using analgesic medication according to three core principles:

- Oral administration ("by mouth"): This is the favored route because it is most convenient for patients and their caregivers.
- Scheduled dosing ("by the clock"): Medications should be given regularly throughout the day and night to guarantee constant pain control.
- Stepwise progression ("by the ladder"): Treatment should begin with milder pain relievers and move to stronger ones only when necessary. This strategy helps avoid side effects from stronger drugs when they aren't needed. Overuse (>10 days in a month) of headache medication like triptans, ergots and opioids, is known to cause rebound headache or medication-induced headache.¹⁴

Surgical interventions are essential when conservative treatments prove ineffective. The choice of surgical procedure depends upon the pathology identified and includes functional endoscopic sinus surgery, adenoidectomy, tonsillectomy, or correction of nasal septal deviations. Removal of mucosal contact points treats contact point headache.¹⁵ Nerve ablative techniques like chemoneurolysis and radiofrequency ablation are useful in treating patients with refractory TN.¹⁶ The current gold standard surgical treatment for TN is microvascular decompression of the Gasserian ganglion, with a success rate of 90%, and a stereotactic gamma knife is preferred for patients unfit for surgery.⁹

DISCUSSION

The diagnostic landscape of headaches in ENT is complex due to the broad differential diagnoses and the significant overlap between ENT-related pain and primary headache disorders. Misdiagnosis of migraine as "sinus headache" is a particularly common pitfall, leading to inappropriate antibiotic use and delayed effective migraine treatment. Differentiating true rhinosinusitis from migraine with prominent nasal symptoms requires careful attention to the character of nasal discharge (purulent vs. clear), presence of fever, and response to decongestants. A structured algorithm for the management of ENT-related headaches is depicted below.



The high prevalence of primary headaches mandates that ENT specialists are aware of their characteristics and "red flags" that necessitate urgent neurological evaluation. Failure to identify these red flags can have severe consequences for patient outcomes.

Nasal endoscopy is indispensable in the ENT diagnostic workup of headaches. It provides direct visualization of structural abnormalities, inflammatory changes, and potential sources of pain that may not be apparent on external examination. CT imaging of the paranasal sinuses is crucial for confirming sinonasal inflammatory disease and surgical planning, while an MRI is superior for evaluating intracranial pathology, cranial neuropathies, and soft tissue lesions.

Limitations of the current literature include the predominance of retrospective studies and case series, which inherently carry risks of selection and reporting bias. Large-scale prospective studies or randomized trials comparing different diagnostic pathways are challenging but would provide stronger evidence. Furthermore, while the algorithm provides a general framework, the specific investigations and referrals should always be individualized based on the patient's presentation and the clinician's suspicion.

CONCLUSION

Headache is a frequent presentation in otorhinolaryngology, necessitating a systematic and comprehensive diagnostic approach. A detailed history, focusing on headache characteristics and associated ENT symptoms, coupled with a thorough physical examination (including nasal endoscopy), forms the cornerstone of diagnosis. ENT specialists must be proficient in differentiating primary headache disorders from secondary ENT-related causes, particularly the common confusion between migraine and sinus headache. Vigilance for "red flags" is paramount to identify serious underlying pathologies requiring urgent neurological referral and advanced imaging. By adhering to a structured diagnostic algorithm and utilizing appropriate investigative tools, ENT clinicians can effectively identify the cause of headaches, provide targeted treatment for ENT-related conditions, and ensure timely referral to other specialists when indicated, thereby optimizing patient outcomes.

Headaches can be associated with a range of ENT-related issues, and Otorhinolaryngologists play a vital role in diagnosing and managing these conditions. Successful treatment often involves a multidisciplinary approach, with Otorhinolaryngologists working in conjunction with primary care physicians, neurologists, and other specialists to address both the headache and its underlying cause. Timely and accurate diagnosis, coupled with appropriate management, can provide significant relief to patients suffering from ENT-related headaches and improve their overall quality of life.

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